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The portion on kumalas inadvertently omitted between pages 10 and 11 of the September issue is given in the current issue on page 6.

AGRICULTURAL JOURNAL

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DEPARTMENT OF AGRICULTURE, FIJI.

VOL. 9.] DECEMBER, 1938. [No. 4.

EDITORIAL.

IN this issue of the *Journal* a brief obituary notice is given of one of the best of the Native Field Assistants, Joape Kunadei, whose death at an early and useful age is deeply regretted.

The work of the Agricultural Officers amongst the "exempt" men is indicated in an article entitled "Progress in Field Agriculture" which shows that many Fijians in this category have proved themselves to be men of resource, adaptability and stability who are adding materially to the agricultural wealth of the Provinces to which they belong.

The Agricultural Officers are in constant and close touch with these men and exercise much patience and thought in endeavouring to cater for their needs since it is felt that these men will play a large part in the future development of the Colony.

An article portraying some of the experimental work which has been done with tobacco is communicated by Mr. D. A. Donald, who has been in charge of this particular activity for the last three years. He shows that the manufacture of cigars and cheroots from locally grown and prepared leaf has useful potentialities for the Fiji market and possibly also for sales abroad. The statement of costs indicates that, for the right person with an interest in this class of work, there should be a small but remunerative and increasing trade, if sales are made at reasonable prices.

The Senior Veterinary Officer, Mr. Turbet, contributes a useful article of practical application in regard to one of the commonest animal pests in the Colony, the flea, which whould well repay thoughtful reading and careful practice.

The same author points out in another note the advantages accruing to the small farmer by the adoption of mixed farming, which he shows to be not only lucrative but beneficial in the maintenance of soil fertility and is in addition a material asset in that it creates a supply of health-giving milk for the young.

The inadequacy of communications in the Pacific is well seen in the dispatch of the minute Javan wasp *Pleurotropis* which to reach Tonga had to travel *via* New Zealand, a journey over five times the shortest distance between the two Groups. The work of a Native Field Assistant in getting it to Suva, whence it went also by air mail to New Britain, is an excellent feat.

Other articles deal with the cultivation of staple food crops such as "dalo," "kumalas," bananas, &c., and Mr. Surridge describes a successful method of germinating teak seed under local conditions.

Several interesting subjects are discussed in the section of Reviews. Possibly that of most importance is the description of the preparation of soya bean milk—a product which can be of immense value to those sections of the population who are not yet accustomed to keeping cattle and whose children rarely get fresh milk. The soya bean can be readily grown locally under fair average conditions and gives good crops of beans as well as being a useful fodder for cattle.

During 1938, the price of copra has been very low and it would appear that the price for this year would average about £6 1s. 0d. locally and about £10 10s. 0d. in London. Much sympathy is felt towards estate producers of copra who must find it difficult to make ends meet existing under conditions which it is hoped will improve next year. During the recent sittings of the Legislative Council His Excellency the Governor stated that he hoped to initiate informal discussions regarding the present depressed conditions of the copra industry and developments along these lines will be watched with considerable interest.

It is anticipated that useful reading for all tastes will be found in this issue which includes an index for Volume 9, now brought to a close.

PROGRESS IN FIELD AGRICULTURE AMONGST FIJIANS.

By
H. W. JACK, M.B.E., D.Sc., B.A.
Director of Agriculture.

AMONGST natives as a whole, the progress made in agricultural pursuits is extremely difficult to gauge for many obvious reasons, but as regards the progress made by individualists, records are gradually being compiled which definitely indicate material progress in the last few years.

The available records of such individualists ("exempted men") are briefly summarised in the annual reports of the Agricultural Officers for last year and extracts from those reports readily portray the present situation.

In the Central Agricultural Division—which embraces the Provinces of Naitasiri, Rewa and the south of Tailevu—the Agricultural Officer reports as follows for the year 1937:—"During the year the number of individual exempted Fijians engaged in agricultural pursuits increased to 91 as follows:—Naitasiri Province, 50; Tailevu South, 32; Rewa, 9. Men under group exemption numbered 47. All of these men were visited frequently and were assisted as much as possible with seeds and plant material, the marketing of their produce and general advice.

"The following crops were grown by exempted men:—

Sugar cane	42 acres	Tapioca	9 acres
Bananas	117 ,,	Yams	21 ,,
Rice	14 ,,	Maize	3 ,,
Coconuts	11 ,,	Vegetables	2 ,,
Kumalas	23 ,,	Ginger	5 ,,
Dalo	92 ,,	Tobacco	3 ,,

"Three thousand six hundred and twenty-one cases and one thousand seven hundred and sixty bunches of bananas were produced by forty-two exempted men on the Waidina and Waimanu rivers, and production was frequently in excess of quotas. The arrangement whereby a separate quota of cases was allotted to these men at packing stations worked well and did much to stimulate production of good fruit.

"Eighteen tons of kumalas were marketed by the Department of Agriculture on behalf of twenty Fijian growers in the district who received a total net return of £115 (approximately).

"Stock and implements owned by exempted men are as follows:—Working bullocks, 22; horses, 14; ploughs, 24; harrows, 18. Advances for purchase of copra kilns, stock and implements totalling £100 were approved and the sum of £86 collected in connection therewith.

"The relationship between exempted Fijians and others was much improved and the Provincial Councils concerned passed resolutions of considerable assistance to these men by allocating sums of money for purposes of advances for agricultural implements and by approving the selection of the three best men annually for exemption without payment of the fee. The co-operation of the Bulis has been valuable.

"Efforts were made to encourage proper tenure of land under the Occupancy Licence Regulations but with little success owing to the frequent unwillingness of owning 'mataqali' to give their consent to the leasing of the land although quite willing for it to be used without a licence to occupy.

"Generally speaking, the progress of exempted individuals has been better than of those working in groups (*i.e.*, exempted communities)."

Of the Western Agricultural Division, which embraces Lautoka, Nadi, Nadroga and Colo West, the Agricultural Officer gives the following summary of the present position:—"Particular attention has been given to those who were 'exempted' from communal duties during the year. All have been visited at least twice during the year, and many more frequently. As well as encouraging all forms of agricultural and stock raising endeavour, advice and persuasion has been exercised with regard to improving the location and type of house, water supply and sanitation.

"There were 202 'exempted' men in 1937 within the Western Division, 30 of whom were absentees or engaged in other than agricultural pursuits.

"The following figures indicate the activities of 'exempted' men in the Division (Lautoka excepted) and are compiled from the reports of inspections by Native Field Assistants:—

	Colo West.	*Nadroga.*	*Nadi.*	*Totals.*
'Exempted' Men	100	47	25	172
Dependents (lewe ni vale) ..	653	221	117	991
Houses (including kitchens) ..	195	20	29	243
Latrines	79	20	10	109
Stock-yards	29	3	16	48
Cattle	562	286	637	1,479
Horses	397	209	99	705
Pigs	146	25	5	176
Poultry	741	164	301	1,206
	Acres.	*Acres.*	*Acres.*	*Acres.*
Sugar cane	12	75	36	123
Rice	41·7	34·6	15·5	91·8
Maize	69·1	8·6	·3	78·0
Yaqona	40·2	·5	3·7	44·4
Tobacco	12·5	2·3	3·1	17·9
Cotton	6·6	1·9	...	8·5
Yams	54	13·1	9·4	76·5
Taro	31·7	8·2	·8	40·7
Plantain	11·3	6·4	·3	18
Kumalas	3·4	3·5	1·5	8·4
Bananas	9·4	4·2	1·4	15

"The above figures disclose a total of 568·5 acres under cultivation which is an average of 3·3 acres per man. The figures for stock show averages of:—cattle, 8·6; horses, 4·1; pigs, 1; and poultry, 7. This indicates a quite

healthy state of affairs, more especially as many of the individuals are young single men who will be some years building up their establishments."

In Vanua Levu, where records have only recently been inaugurated, the Agricultural Officer writes as follows:—"Exempted men received every possible supervision and assistance. Many of these men, particularly in the coconut areas, are in every comfortable circumstances and in many cases considerably better placed than the men of their type on Viti Levu. Some are engaged in storekeeping. The advice and assistance of the Native Field Assistants has been eagerly sought after by these people and in the vicinity of the training farms exempted Fijians are endeavouring to grow the crops to be seen at the farms. A census of 27 exempted men in the province of Bua revealed the following information:—

	Acres.
Area under cultivation (exclusive of coconuts) ..	48
Area under coconuts	151
Area under rice	10·5
Horses	12
Working bullocks	26
Milking cattle	12
Poultry	257
Ploughs	9
Harrows	4
Tonnage of copra sold	48 tons
Money in Savings Bank	£69 0 4
Value of produce sold (other than copra) ..	179 12 0

"Of these twenty-seven men, three are engaged in storekeeping as well as agricultural work.

"A perusal of the figures above will show that the exempted men in the poorest province of this Division are considerably better placed than the Fijians in the towns. It has been the men of this class who have helped most in the work of copra improvement in the Division, and it is to be regretted that the lack of suitable markets, high transport costs and the distance from market have prevented systematic marketing of produce for them."

In the Eastern Division of Viti Levu, the Agricultural Officer reports that there are 147 exempted Fijians. Of these, only three have been reported as unworthy of continued exemption.

In the small Fijian settlements of Dobuilevu and Waimaro there are 14 and 17 settlers respectively. These settlers are adequately housed, with satisfactory sanitation and have abundance of food crops; they all grow some money crops including rice, maize, cotton, potatoes, tobacco, bananas, vegetables, &c. At Dobuilevu they have savings bank accounts and run a school at which the average attendance is 41 children between the ages of 5 and 15 years, and the children look healthy and happy. Each settler has his own land clearly defined and in time each allotment will be properly fenced. The settlers have also started a co-operative society to which each subscribes, the aim being the purchase of working animals, implements, fencing wire and other needs of small farmers.

The value of King's Road, which traverses this area, is beginning to be realised by the Fijians and native lands along the road would be even more rapidly taken up except for restrictions which prevent them from leaving their villages.

In the Southern Agricultural Division there are 124 "exempted" Fijians who cultivate 327 acres of various crops including sugar cane, bananas,

" dalo," " yaqona," tapioca, yams, coconuts, rice and European vegetables (in Kadavu). Amongst the total number, five individuals are interested in dairy farming and own and work 236 head of cattle and ten have poultry aggregating 136 head, while several cut firewood and timber regularly for sale in Suva.

These reports from Agricultural Officers, who are now properly organised and provided with some trained native assistants, indicate clearly that the Fijians are gradually moving towards individual settlement on their own lands or on lands rented from the Crown and practical assistance is given to them as much as possible. In this work of helping individual settlers the co-operation of the Produce Inspector with the Agricultural Officers plays a most important part in arranging for the collection, sale of produce and payment of returns as early as possible to the producers. In this connection it is felt that the establishment of regular marketing centres would prove stimulating and it may be mentioned that a weekly local market day has already been tried with some success in certain areas.

In assisting " exempted " men, their efforts are directed firstly to matters concerning housing and the production of food crops. They are encouraged to build their own houses with the assistance of two or three friendly neighbours so that construction costs will remain low. Housing includes an adequate living room, an efficient kitchen, satisfactory drainage, and sanitation arrangements. Efforts are made to induce settlers to diversify their food crops as much as possible so that they will include " dalo," yams, tapioca, sweet potatoes, breadfruit, beans, cabbage, coconut, pawpaw, bananas and various citrus and other fruit trees. In addition, the main money crops at present encouraged are coconuts, bananas, " yaqona," tobacco, rice, cotton, groundnuts, sugar, ginger, maize and vegetables. It is also intended to encourage other money crops as soon as planting material becomes available in sufficient quantity for distribution from the various agricultural stations where suitable crops are being tried and propagated as rapidly as agricultural conditions and finances will permit.

The keeping of poultry for food and for profit and of cattle for food and as working animals are also being encouraged and a few individualists already keep pigs and horses.

Exempted men are also stimulated to pay their taxes and rents in due time, to be loyal citizens, to get married early, to look after the welfare of their children and to appreciate the many benefits the peasant farmer enjoys in the easy living conditions of Fiji.

The Fijian, as far as his own food crops are concerned, is a good farmer but for various reasons he neglects to conserve his soil or to use it fully and economically and it is hoped that he will gradually learn to appreciate the value of regular rotation cropping and to adopt inexpensive methods of soil conservation as his farming energies become restricted to smaller areas than those to which he is habitually accustomed under existing general conditions.

Recently, the writer visited the Naduna settlement in the Waidina River district where seventeen individual farmers have been established on adjacent holdings of Crown land since the middle of 1936. The majority of these men are married, each has an adequate but unpretentious house, kitchen and latrine and the water supply is abundant. All have an evident surplus of food crops; all have some money crops in addition and all have savings bank accounts varying from £2 up to £39. They have built a schoolhouse and quarters for a schoolmaster and conjointly with the nearest village,

pay their own schoolmaster, and the average attendance in the school is 39 children. The children are neatly and uniformly dressed, look healthy, well fed and happy and are a credit to the settlers who themselves seem to be a happy lot.

The progress briefly outlined in these notes indicates that the Fijians are becoming anxious to settle on their own lands, hence every effort is made to give them sympathetic and practical assistance in their endeavours at self expression, for it must be clearly understood that individuals settle entirely of their own free will.

The reports further indicate that these individual farmers are slowly but steadily creating wealth in their respective provinces and proving a desirable and valuable asset to the Colony. As large numbers become settled as peasant farmers and as their primary needs in the way of housing, food and certain necessary purchases are supplied, it is expected that they will thereafter turn more and more to money crops of exportable value and this hope will be kept in view though progress in land settlement in Fiji cannot be evaluated in terms of exports.

The essential matter is, however, that they should become settled on their own lands, with an abundance of the necessaries of life, as contented, happy, loyal citizens, rather than that they should amass money which rarely brings happiness to the native.

NATIVE FOOD CROPS OF FIJI.

By
L. W. HARWOOD, H.D.A.,
Agricultural Officer, Islands.

[A portion inadvertently omitted from September issue between pages 10 (Breadfruit) and 11 (Percentage Composition of Food Crops) in article "Native Food Crops of Fiji."—EDITOR.]

BREADFRUIT.

Propagation of the seedless type is by root cuttings, layers or suckers.

KUMALAS (*Ipomœa Batatas*).

The kumala or sweet potato is also a native of South America and was well known in Europe before the common potato. The plant is a perennial with a trailing stem and a purple flower. Roots are sent out from each node of the stems and the original roots and those sent out from the stems bear prolifically. There are believed to be about 50 varieties.

The kumals requires a similar type of soil to the yam and in Fiji may be planted each month. Good drainage is essential.

NATIVE METHOD OF PROPAGATION AND CULTIVATION.

Cuttings of the stems are planted in specially prepared mounds, the distance between each mound being about 3 feet to 4 feet. At each weeding care is taken to hill up the mounds, the success of the crop depending on whether the kumalas are hilled or not as unhilled kumalas give profuse leaf-growth but do not bear much. The crop is weeded continuously and matures in 3 to 5 months. Well-planted kumalas should yield up to five tons per acre but with the native methods yields over three tons per acre are not usual.

SUGGESTED NEW CROPS.

Despite the fact that the natives in some Provinces have an abundance of food crops, it appears that they are too starchy and lacking in protein. Fats are provided by the use of coconuts. It is thought that more attention should be paid to the growing of European vegetables, soya beans, cowpeas, and greater stress laid on the Fijian green vegetables such as " bele," " ota " and " moca."

Soya bean is a crop which should be of great value to the Fijians as the following figures will show:—

PERCENTAGE COMPOSITION OF FOOD CROPS.

Crops.	Water.	Ash.	Crude protein.	Carbohydrates.		Fat.
				Fibre.	Nitrogen free-extract.	
Cassava	67·4	1·0	1·1	1·4	28·8	0·3
Kumala.	68·8	1·1	1·8	1·3	26·4	0·6
Soyabean (seed)	9·9	5·3	36·5	4·3	26·5	17·5
Cowpea (green legume) ..	83·7	2·0	3·0	3·8	7·0	0·5
Dalo	62·7	1·2	3·5	0·5	31·5	0·6

LOCAL CIGAR AND CHEROOT MANUFACTURE.

By
D. A. DONALD, H.D.A.,
Agricultural Officer, Western Division.

FOR some years past, as opportunity offered, experimental work on a small scale has been undertaken at Sigatoka Experimental Station, in the manufacture of cigars and cheroots.

The leaf used has all been grown locally from seed imported some six years ago. The local tobacco grown by Fijians and Indians and manufactured into rope twists was found unsuitable for cigars as it is too heavy and coarse in texture with too strong a flavour.

Tobacco culture under the best of conditions is a precarious crop and in Fiji the production of first quality leaf is probably a little less easy than in most other countries. However, some very good leaf has been grown at the Experiment Station and a technique evolved to suit local conditions more or less.

The purpose of this article is merely to give some account of the manufacture of cigars and cheroots. First quality leaf suitable for " fillers " and " binders " is capable of production in Fiji. At the station the best all-round variety for this purpose has been found to be " Resistant Havana." For lack of a better leaf this variety has also been largely used for " wrappers." A number of typical cigar type varieties have been imported and are under trial. Culturally there are one or two very promising ones but until it has been possible to test them under " shade " and provide for the leaf the very best curing and fermenting conditions, their value for " wrappers " remains questionable. Three very fine barns have just been completed at the Experim nt Station and these represent the acme of air-curing under local conditions.

The previous attmpt to grow leaf under " shade " for wrappers resulted in failure owing to high winds destroying the flimsy calico shade. Next year it is intended to use a more sturdy lath " shade " and the writer confidently expects to be able to produce a first class-leaf.

The cost of producing leaf varies considerably and depends mostly on the weather conditions and the quantity harvested. The average cost of dry-cured leaf from the time of preparation of the land to the time of manufacture, taken over three seasons, is approximately eighteen pence per pound. This figure is considered capable of reduction to less than one shilling as experimentation and " trial and error " methods have been necessarily expensive.

Manufacture.—Many and varied were the trials and tribulations met with in manufacture. Leaf from bulks 18 months to 2 years from date of harvest is used: this ageing is important as all smell of ammonia and strong flavour must have departed.

Each leaf is examined for mould or blemishes such as excessive chlorophyle or " frog eye " spots: broken or torn leaves are suitable for " fillers."

All the selected leaf is then dipped in a wash made by boiling in water, coffee, sugar and a pinch of soda, to which a small quantity of whisky is added. At this stage while the leaf is wet further grading is done. The " wrapper " and " filler " leaves are selected for colour, texture, and freedom from blemish, the remaining leaves will be used for " filler."

" Filler," as the name implies, fills the centre of the cigar or cheroot and is over 95 per cent. of the bulk of the finished article.

" Binder," binds the filler together roughly in the shape it will eventually take and needs to be of fairly good quality but appearance is not so essential as with the next class of leaf.

Wrapper.—These leaves need to be as tough as possible but fineness and freedom from blemish are essential. Colour is most important as the majority of cigars sold are purchased on the appearance of the wrapper leaf.

No machine, so far as the writer is aware, has yet been evolved that will make cigars. There are, however, a number of machines for manufacturing cheroots and a small single unit machine was obtained for trial at the Station in 1937. Although the machine is very useful, not a little skill and experience is required to turn out good quality. Up to the present only experimental quantities have been made with the machine but sufficient experience has been gained to indicate the possibilities for the production of cheap good quality cheroots for local consumption.

Cigars and hand-made cheroots are made in the same way, differing only in shape. The process of rolling consists of laying the small pieces of " filler " in parallel rows and rolling with the " binder " leaf roughly to the shape desired. The half-formed cigars are then placed in moulds and pressed for two or three hours, when the final " wrapper " leaf is rolled on and a spot of arrowroot paste is used to secure the end after trimming. The cigars are replaced in the moulds till the following day and may then be finally trimmed on the guillotine. Thereafter it is merely a matter of storage for maturation in a reasonably cool, constant temperature and low humidity. Like most other good things, cigars improve with age if kept under the right conditions and should not be smoked for at least 6 months after manufacture.

The cost of manufacture at the Station in the 1937 season is given below as a matter of interest. Larger production would, of course, reduce costs still further.

Cigar manufacture—

6,200 cigars were manufactured

Cost of leaf (1936 crop)			1/2 per lb
Allowance—25 per cent. (loss of midrib, &c.)			3½d. ,,
Cost of leaf per lb of cigars			1/5½ ,,
Average number of cigars to the pound			86
Labour cost of making 6,200 cigars			£14 6 7
Cost of leaf, 73 lb at 1/5½d.			5 5 5½
Cost of flavouring ingredients			1 1 3
Total cost			£20 13 3½
Cost per cigar			0·8 pence

Cheroot manufacture—

3,400 cheroots were manufactured

Cost of leaf, plus 25 per cent. allowance for waste			1/5½d.
Average number of cheroots to the pound			190
Labour cost of making 3,400 cheroots			£3 4 0
Cost of leaf, 18 lb at 1/5½			1 6 3
Cost of flavouring ingredients			5 3
Total cost			£4 15 6
Cost per cheroot			0·34 pence

The above makes no allowances for cost of supervision, buildings or rent of land.

FLEAS AND THEIR CONTROL.

By
CHAS. R. TURBET, B.V.Sc., M.R.C.V.S.,
Senior Veterinary Officer.

FORTUNATELY in Fiji the human flea does not appear to be common and man therefore is saved much suffering. Not so fortunate are our dogs and cats which, when not well cared for harbour these parasites in large numbers, causing much discomfort to their hosts and even disease under some circumstances.

Adult fleas are well known to be blood suckers and the irritation they cause is probably well known to most readers. We should, therefore, bear this in mind and endeavour to relieve the needless suffering of our animals occasioned by the presence of these parasites.

Fleas are not constant parasites of the same host. They may leave one host and go to another of the same or of a different species. That is, a dog flea may leave a dog and go to another dog, or to a cat or to man. Except when fleas are starved man, fortunately, does not appear to be a favoured host of the dog flea.

Adult fleas suck the blood of their host and after mating has occurred the female fleas lay their eggs on the host or in dust. The eggs are small oval pearl-white in colour, visible easily to the naked eye. These hatch quickly in Fiji owing to the warm moist climate and probably forty-eight hours would be the shortest hatching period. The larvæ are active small maggot-like creatures which feed on dried blood and organic matter occurring

in dust. The larval stage lasts about seven to ten days, at the end of which period a pupa is formed inside a cocoon, where it remains from ten to seventeen days to emerge as the adult jumping flea.

In Fiji where dogs and cats are kept continuously, fleas seldom if ever become a nuisance in human habitations.* This is so because dogs and cats being so attractive to the fleas, collect to their own bodies practically all fleas in the vicinity. Many of these fleas subsequently leave their host in situations unfavourable to their existence and perish but many more feed and reach maturity and eggs are produced by the female.

The type of dwelling used in this country is favourable to the existence and propagation of fleas. Firstly, flea eggs may hatch in the dust in the cracks between floor boards, whilst the open space underneath so many houses in Fiji is admirably suited to the needs for the development of fleas. When these spaces are frequented by dogs, fleas and eggs drop off into the dust which in Suva is usually soapstone and which is a most favourable medium for their development. Where dogs have access to these open spaces a constant source of reinfestation is provided and it is difficult a matter to rid the hosts of their parasites.

When domestic animals have had access to human habitations and then, for some reason or other are no more allowed access to the house, a plague of young hungry fleas is usually experienced by the inmates. This is due to the development into adult fleas of the last batch of eggs to be dropped from the former dog or cat inhabitant. Since there is no longer a natural host to collect them, the young fleas suffer acute hunger and under these conditions attack human inhabitants of the house. They often occur in large numbers and constitute a serious nuisance to householders.

Apart from causing actual pain, worry and annoyance to their host, fleas may carry disease. Among such may be mentioned, fortunately not in Fiji, plague among human beings, carried usually by the rat flea. Among dogs and cats they act as intermediate hosts of the tape worm, *Dipylidium caninum*. Although not the principal carrier of the heart-worm of the dog, they are actually able to transmit this disease from one dog to another.

Knowing as we do, the life history and habits of fleas, their control is not difficult if the matter is seriously taken in hand and efforts to control persisted with. If there is a source of infection dogs and cats will become reinfested over and over again in spite of treatment. Efforts, therefore should aim at the eradication of the flea from the body of the animal and at the distruction of the eggs, larvæ and pupa in their breeding places.

Dogs and cats may be and should be kept reasonably free from the parasites by regular, say, twice weekly, dusting the hair or fur with a derris or pyrethrum powder. The latter powder may be purchased from the Department of Agriculture for 1s. 6d. a half-pound tin. A very good proprietary preparation on the market is that known as Pulvex. After dusting, collect as many fleas as is possible on newspaper as they fall from the animal, then burn them in the paper.

In the control of breeding places quite the most important step is to render the space underneath houses and sheds dog-proof. This can usually be accomplished by boarding in or by the use of wire netting. Should it not be possible to do this, it will be necessary to treat the surface of the area by spraying with a kerosene emulsion made as follows:—Boil ½ lb of soap in one gallon of water. When the soap is dissolved, add with constant agitation, 1 gallon of kerosene so that a creamy emulsion is formed. For use, add one pint of this to each gallon of water.

* Specimens of dog fleas forwarded by the writer of this article were found to be *Ctenocephaloides felis* Bouché.—EDITOR, A.J.

Fleas may also be destroyed by sprays with one of the patent fly-spraying solutions on the market. The animals however, usually resent being sprayed with such preparations.

Mild disinfectant baths for animals such as Cooper's sheep dip: 1 per cent. Cyllin, and many other preparations are effective in removing and killing the parasites.

Should a plague of fleas appear within a house as described above, they may be killed by washing the floors with kerosene emulsion. Rugs and mats should be well shaken or cleaned with a vacuum cleaner. They may also be dusted with one of the before-mentioned powders.

The usual house cleaning done as a daily routine in Fiji houses is in itself a measure of control. As a final word, it should be remembered that the free daily access to the house of well-cared-for animals is not a factor conducive to the occurrence of flea plagues.

ECONOMIC INSECTS IN SOME WESTERN PACIFIC ISLANDS.

By
R. J. A. W. LEVER, B.Sc. (Hons.), D.I.C., A.I.C.T.A., F.L.S.,
Entomologist.

SEVERAL inquiries have been received during the last twelve months from the various Pacific Islands, usually coupled with requests for beneficial insects to be introduced.

Working from Polynesia in the east to New Guinea in the north-west, the first group to be dealt with is Tahiti (where 800 *Plæsius javanus* Er. or Jepson's beetle had been forwarded in June, 1937) and it was stated that the banana-borer, *Cosmopolites sordidus* Chevr., is now doing less damage to the native bananas. Requests were made for the rate of spread of *Plæsius*, its relative efficiency as a predator and life-history. Control measures for Aleyrodidae ("white flies") on *Ipomœa* (sweet potato) and garden ants were given and identification made of the tree *Barringtonia edulis*.

The Cook Islands, whose main island is Rarotonga, made requests for fruit-fly parasites so *Tetrastichus* and *Dirhinus* were sent in December, 1937, and these two plus *Syntomosphyrum* in June, 1938. To control the banana-boring weevil a consignment of *Plæsius* was also sent last December.

Western Samoa (New Zealand Mandate) had sent to it, in response to a similar request, adult and pupal *Tetrastichus* (which arrived in excellent condition) in October, 1937, and this parasite, with *Dirhinus*, arrived in the following December with a 100 per cent. survival. These two Chalcids plus *Syntomosphyrum* were again dispatched in November, 1938, all for controlling *Chætodacus* in grape-fruit and other citrus orchards.

The Tonga or Friendly Islands asked for *Teleonemia scrupulosa* Stal. (formerly *T. lantanæ* Dist.) to control lantana and a colony sent in November, 1937, is now said to be definitely established. The introduction of *Pleurotropis* for control of the leaf-mining beetle *Promecotheca* is dealt with below.

As a consignment of *Teleonemia* sent by the then Entomologist early in 1937, had arrived dead at Nouméa, a colony was dispatched by the writer to New Caledonia where it was said to have arrived "en parfait état."

Requests from the New Hebrides were for details of the life-history of *Telenomeia* (which had been sent there in 1935 and early in 1937); possible biological control of the blue rat-tail weed *Stachytarpheta jamaicensis*, and correspondence about, and an interview with His Honour the British Resident Commissioner on, the Javan *Pleurotropis* which controlled the leaf-miner so successfully. Hints were also forwarded to a missionary for control of rats on the small island of Tongoa in this Group.

The beetle pest of taro (*Colocasia*) and banana, *Papuana huebneri* Frm., introduced accidentally into the Gilbert Islands, probably from the Solomon Islands or Bismarck Archipelago, is continuing to spread and its control by means of paradichlorobenzine was recommended. It is said to have reached the Ellice Islands to the south.

The attempt to introduce *Liothrips urichi* Karny into the Solomon Islands was unsuccessful for various reasons. The time chosen (May) by the interested firm was far too cold, the plants were overwatered after leaving Sydney, kept for some time in the steering-room in the tropics and no host-plants (*Clidemia*) were available at the end of the long voyage *via* New Zealand. However, a few thrips were liberated in the Shortland Islands and a direct shipment may be made in 1939 by an escort vessel. Additions to the list of host-plants of the Coreid bug *Amblypelta* were made and the draft Rules for its quarantine in the Russell and Shortland Islands revised. The same applies to the non-conveyance of living palms from the Santa Cruz Group into the rest of the Protectorate: this is to isolate the leaf-miner *Promecotheca opacicollis* Gestro. Advice has been given about an Australian Tachinid parasite of *Amblypelta* and on the moth *Ephestia* in copra stores in the Solomon Islands.

The Javan wasp *Pleurotropis* was sent by air to Rabaul, Mandated Territory of New Guinea and is dealt with fully below. Correspondence has been on the thread-blight of coconuts (*Corticium penicillatum* Petch), which has a wider range than suspected previously, and some coconut scale insects.

Finally, the editing of Mr. Simmonds' Bulletin No. 20—"Coconut Pests and Diseases"—incorporated many additions to the insects of this palm with various alterations in systematics.

Although also in the Pacific, the Hawaiian Islands are sub-tropical and north of the equator. The ladybird *Cryptognatha* was sent to control the scale *Pinnaspis buxi* Bouché and the parasite *Syntomosphyrum* against the fruit-fly, *Chætodacus* spp.

ENTOMOLOGICAL NOTES.

1. JAVAN PARASITE OF THE COCONUT LEAF-MINER.

By
R. J. A. W. LEVER, B.Sc. (Hons.), D.I.C., A.I.C.T.A., F.L.S.,
Entomologist.

In March, 1937, a telegram was received in Fiji from the Director of Agriculture at Rabaul, Mandated Territory of New Guinea, asking for the immediate dispatch of a colony of the Javan *Pleurotropis*. This minute parasite of *Promecotheca nuciferæ* Mlk. was introduced to Lau by Dr. Taylor in 1933 (1) and soon reduced the local leaf-mining beetle (*Promecotheca reichei* Baly) from a serious pest to a scarce insect. It was to control similarly the related *P. papuana* Cziki in New Britain and Manus (2) that this request was made and how serious the damage was can be judged from the following report. "The estate [in New Britain] presents a dreadful appearance and is the worst infestation of *Promecotheca* of which there is any record in the Territory. When walking through the plantation one hears on all sides the dropping of immature nuts which the palms can no longer sustain. Many of the trees have already succumbed, 370 dead palms having been cut down and destroyed, while there is not a single flower-spathe on the whole plantations so that no crop can be expected for two years, even from those trees that do eventually recover" (2).

WESTERN & CENTRAL PACIFIC OCEAN.

E. W.
180

Air mail route - - - - - -

Steamer routes ————

0 Equator 0

Manus

NEW GUINEA

Rabaul

NEW BRITAIN

SOLOMON ISLANDS

Shortland

1,250 miles

SANTA CRUZ

NEW HEBRIDES

Efate

Vila

850 miles

NEW CALEDONIA

Noumea

AUSTRALIA

23½ S.

GILBERT and ELLICE ISLANDS

2,800 miles TO Honolulu

FIJI

Suva

Vanua mbalavu

SAMOA (N.Z.) (U.S.)

TONGA

Nukualofa

COOK ISLANDS

Rarotonga

23½ S.

1,100 m. from Auckland

1,150 miles to Auckland

0 500 1,000

E. W.

RAF

The then Entomologist in Fiji stated in reply to the cable that owing to the remoteness of Lau—where alone the parasite was abundant—from the capital (Suva), it would require the services of a full-time European officer and it would not accordingly be possible to send any parasites during 1937.

Meanwhile, a similar request had been received from Tonga (where the same species of beetle occurs as in Fiji and Samoa) and it was decided to send a trained Fijian laboratory attendant to Vanua balavu in the Lau Islands to collect the desired *Pleurotropis*. This man—Ratu Filipe Lewanavanua of Gau—had been working with Dr. Taylor in Lau in 1933 and 1934 and the work therefore was familiar to him. For the first two months, however, the project looked very unhopeful as owing to this intense suppression of the host it was not possible at first to recover a single parasite. Eventually in June three kinds were sent to headquarters from Lau, viz., *Elasmus hispidarum* Ferr., *Anastatus* sp.—both truly indigenous insects—and the wanted *Pleurotropis*. The dispatch of a pocket microscope from Suva enabled the white marks on the legs of *Pleurotropis* to be seen so as to distinguish it from *Anastatus*, in which they are absent. After a further three months' search by this native laboratory attendant, a consignment of the desired wasp and parasitised beetle larvæ and pupæ was brought in to headquarters from Lau, a distance of over 180 miles. A new generation was then bred up and sent to Sydney, half being put on board in cold storage. From Australia it was flown across New Guinea and was in Rabaul twelve days after leaving Suva. Advance information by cable of its arrival allowed of host larvæ and pupæ being collected so that a new generation could be bred immediately it reached New Britain. 180 adults were received or reared.

A previous attempt to introduce *Pleurotropis* into New Guinea from the New Hebrides, where it was introduced from Java in 1937, had proved a failure. In that group of islands, as in the Santa Cruz to the north (3), the leaf-miner is another species, *Promecotheca opacicollis* Gestro, very closely related to the other two, *P. reichei* and *P. papuana*, the latter formerly referred to as *P. antiqua* Weise. In an attempt to keep *P. opacicollis* from reaching the Solomon Islands proper from the Santa Cruz Islands to their east, a Rule (5) was passed forbidding the landing in any other portion of the Protectorate, of any portion of fresh palms from the Santa Cruz District where this beetle does not so far occur.

Besides this introduction to New Britain, *Pleurotropis* was also sent to Tonga which although only 450 miles south-east of Fiji, has no shorter inward communication from Suva than *via* Auckland, New Zealand, a total distance of 2,500 miles, taking three weeks.

Although only forty parasites have reached Nukualofa alive, it has been stated by Dr. Taylor that ten paired females are usually sufficient to establish a colony. The long voyage *via* cold New Zealand is naturally not to this tropical insect's benefit and three weeks in a ship's cooler at 40° F. is a very harsh set-back. Communication from Lau to Suva is by cutters only and their sailing may not correspond with a supply of parasitized material.

Some 100 parasites which emerged later were liberated at Colo-i-Suva in the immediate vicinity of the stouter *P. bicolor* Maulik which is found mining the leaves of *Flagillaria* or " were "—a climbing palm.

At a daily mean temperature in Suva ranging from 71° to 81° F.,* *Pleurotropis* took 19 to 25 days to develop within the young stages of its host which also attacks the ivory nut palm (*Metroxylon*) on Viti Levu Island.

* From data recorded by Harbour Master in *Fiji Royal Gazette.*

It is worth mentioning that the males are easily distinguished from females both by their smaller size (1·1 mm. as against 1·5 mm.) and by the absence in the female of a green iridescence on the ventral thoracic surface. This point was not mentioned by Ferrière in his description (4) of this insect from dead specimens as he says males are " quite similar " to females and gives the length of the latter sex as 1 to 1·1 mm., which is too short. From a practical point of view, females can be quickly separated from males by their habit of going towards the lighted end of a tube.

REFERENCES.

(1) Taylor, T. H. C. 1937. " The Biological Control of an Insect in Fiji."
(2) Murray, G. 1937. *New Guinea Agricultural Gazette*, Vol. III, No. 2.
(3) Lever, R. J. A. W. 1933. *British Solomon Islands Agric. Gazette*, Vol. I, No. 4.
(4) Ferrière, C. 1933. " Stylops," *Royal Entomological Society of London*, Vol. 2, Pt. 4, April.
(5) British Solomon Islands Protectorate, Palm Pests Rules, 1938. Published in Fiji.

2. LOCAL FRUIT-FLIES AND THEIR PARASITES.

The yellowish-brown fruit-fly formerly referred to as *Chaetodacus xanthodes* Broun has recently been found by the Imperial Institute of Entomology to belong to the genus *Notodacus*. Its original description was made in 1905, not 1903 (1) or 1904 (5).

A point which might be ambiguous in Simmonds' excellent *Bulletin* No. 19 (1) is his remark that this scarcer fruit-fly " is curiously attracted to human flesh " which suggests the responses of a blowfly or a blue-bottle. This remark is really intended as a reference to its habit of settling on human skin when one's hand is put inside the rearing cage.

Its scarcity is such that Simmonds states that in 1932 it was only one-tenth as numerous as *Chaetodacus passiflorae* Frogg. and shortly before this not one *Notodacus* had been recorded though 30,000 of the commoner fruit-fly had been reared. This makes Kirk's remark (2) that it " is commonly found in Fijian and Rarotongan fruit, both pineapples and oranges," a peculiar one as if it is scarce to-day it could hardly have been " commonly found " thirty years ago. Kirk's record was made from fruit on arrival in Sydney.

Of a similar antiquity is Froggatt's attribution (3) of Fiji as the home of *C. psidii* Frogg. as this fly is almost certainly confined to New Caledonia, Samoa and Tahiti. No specimens have yet been recorded from Fiji and Jepson (4) scouted the record two years after it was made. Unfortunately a new lease of life was given to this locality through its publication in Bezzi's book (5) in 1928. Proof that Froggatt's remark is at least questionable is amply seen from this same publication (3) where *Dacus ornatissimus* is correctly given on page 93 as being a fruit-fly from New Caledonia, yet opposite the illustrations it is said to be from Fiji which is certainly incorrect.

It must be stated, however, that *C. curvipennis* Frogg. of bananas is found in this Colony though it is extremely scarce as only a single specimen has been taken in over three years' work on these insects by Simmonds and the writer. This is a retraction of the latter's remark in the September *Agricultural Journal*, page 19, where it is said not to have been recorded locally. Jepson's remark (4) made in 1911 is as true now as then viz., that " there is no record of this fruit-fly causing any damage to bananas in this Colony." However, the presence of this insect is sufficient to prohibit the import of Fijian bananas into the United States of America despite its rarity and lack of damage in Fiji.

An unrecorded host-plant of the commoner *Chætodacus passifloræ* Frogg. has been found on a labelled specimen taken by Mr. R. H. Phillips as long ago as 1929 and returned from London; the fruit is the star-apply (*Chrysophyllum cainito* L.), and introduction from the West Indies.

As the third larval instar was given in the Bulletin already mentioned as being " very variable " and " differing greatly in the length of time," it was decided to find the average period which, using cucumber, was in October, 1938, 4½ days at a temperature of 71° to 81° F. The total period from egg to pupa was only 7 to 10 days and the pupal period 9 to 11, making a total period of 16 to 21 days. Simmonds, although giving a total range of 7 to 19 days as a larva, found the average to be 12 to 16 days which is considerably longer than the writer's experience. With such hard and dry fruits as *Inocarpus* (ivi), cotton bolls and sandalwood seed—all these being host-plant records—the time is naturally longer and with the first-named at least the resulting flies are much smaller in size.

Last year Simmonds (6) recorded an undetermined Chalcid from *Chaetodacus* pupæ which has since been determined by the Imperial Institute of Entomology as *Spalangia cameroni* Perk., a fourth local parasite to be added to *Opius*, *Biosteres* and *Phænocarpa*. This Chalcid has also been reared from the common house-fly, *Musca domestica* L. *vicina* Macq. but its control of it is apparently almost negligible.

REFERENCES.

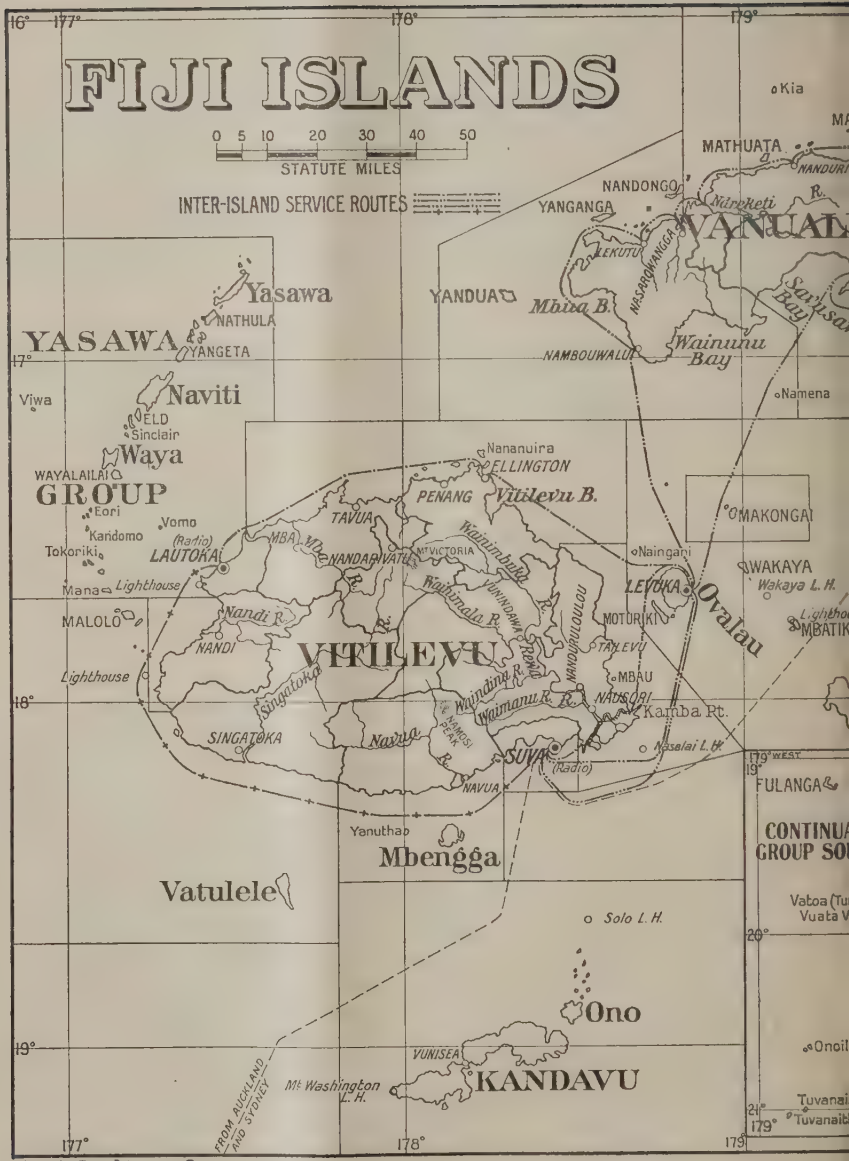
(1) Simmonds, H. W. 1936. *Bull. No.* 19, *Dept of Agriculture*, Fiji.
(2) Kirk, T. W. 1909. *Bull. No.* 22, *Dept. of Agriculture*, New Zealand.
(3) Froggatt, W. W. 1909. *Report for* 1907–08, *Dept. of Agriculture*, New South Wales.
(4) Jepson, F. P. 1911. *Council Paper No.* 25, *Dept of Agriculture*, Fiji.
(5) Bezzi, M. 1928. "Diptera Brachycera and Atherica of the Fiji Islands."(British (Museum).
(6) Simmonds, H. W. 1937. *Agricultural Journal*, Fiji, Vol. 8, No. 3, July.

3. A JAVANESE BEETLE TO CONTROL HOUSE-FLIES.

In 1928, the predatorial Mexican beetle *Copris incertus prociduus* Say. was introduced from Hawaii into the Colony for the control of house-flies. In November, 1938, the beetle *Hister chinensis* Guen.—with similar habits but related to Jepson's banana beetle, *Plæsius javanus* Er.—was sent from Java by Mr. H. W. Simmonds, O.B.E., and 1,400 released by the writer in a paddock in Domain Road and at the race course in Suva.

Beetles of this carnivorous genus *Hister* have a wide range from Central Europe and Turkey into East Africa, Malay Archipelago and Japan to the United States of America. Before liberating this East Indian beetle a number was put in a petri dish with maggots of the house-fly and blow-fly which were attacked voraciously after the beetles' long journey in sphagnum moss. It is hoped that they will devour these maggots in a natural state in cow-dung and the efficient way in which the liberated beetles tunnelled into the ordure in pursuit of their prey, coupled with their powerful flight give every promise that they will will be a success in controlling the house-fly. They should not fall a prey to the giant toad as they spend the bulk of their time within the droppings where they are well protected from attack.

The recently-introduced *Hister* varies in length from 9 to 12 mm. whereas *Plæsius* is usually over 12 mm. long (½ inch) but has only two blunt spines on the last portion but one of the front leg (tarsus) whereas *Hister* has three sharp spines. The latter is also wider in proportion to its length and has the grooves on the wing-covers more pronounced than *Plæsius*. *Copris* may



Lands Department, Suva.

180°
179°
178°
Undu Pt.
Lighthouse
Nggelelavu
Ndrua
VISONGO
Nukumbasanga
TO VANCOUVER VIA HONOLULU
TO SAN FRANCISCO VIA SAMOA AND HONOLULU
Kumbulau Pt.
Thombia
Yanutha
Rambi
Natewa Bay
KIOA
Mouiha B.
Wailangilala
Lighthouse
LAUTHALA
NGAMEA
TAVEUNI
WAIYEVO
(Radio)
Vuna Pt.
SALIALEVU
NAITAMBA
Bay of Islands
Avea
Vanuambalavu
Thikombianiau
HOMALOMA
Susui
MUNIA
YATHATA
Kaimbu
KANATHEA
Vatuvara
Mango
L A U
Katafanga
O R O
UVUTHA
Yaroua
Thithia
S E A
NAYAU
Bacon Id
Vanuamasi
Lakemba
Aiwa
VANUAVATU
G R O U P
ONEATA
Olorua
Komo
MOTHE
Karoni
Moala
WANGAVA
NAMUKAILAU
Navutuira
Yangasalevu
Navutuiloma
Totoya
Kambara
Marambo
Fulanga
ONGEALEVU
Ongeandriki
Matuku
20°
19°
18°
17°
16°

be distinguished from both of these, firstly by being more curved or arched in cross section; secondly by the possession of a large semi-circular plate (clypeus) near the head and lastly by having the tips of the antennæ (feelers) laminated or plate-like instead of being simply clubbed as in the related *Hister* and *Plæsius*.

Should *Hister* become established in Viti Levu it will be introduced into the denser populated parts of Vanua Levu and Taveuni where cattle, and therefore flies, abound. It is hoped also to export it to the Solomon Islands to control the horn-fly *Lyperosia* which causes much worry to stock.

4. LOCAL INSECT PESTS OF BOOKS AND THEIR CONTROL.

Damage to books, periodical and other records in Fiji is due chiefly to attacks from silverfish (*Lepisma saccharina* L.), the Anobiid beetle *Cathorama herbarium* Gorh. and the small brown cockroach *Supella supellectilium* Sow.

It is only very recently that the identification of this Brazilian beetle *Cathorama* has been settled finally by the Imperial Institute of Entomology. Both Jepson (1), and Veitch and Greenwood (2) referred to this insect as *Sitodrepa* (*Anobium*) *paniceum* L. but it now appears that it is really *Cathorama*, not previously recorded from Fiji. This beetle had been confused with both *Lasioderma* (which although occurring locally apparently confines its damage to cigars and cigarettes) and *Sitodrepa* which does not seem to be a true pest as a borer in covers of books. *Cathorama* is parasitised by a species of ant-like Bethylid of the genus *Sclerodermus*.

In a previous issue of this Journal (3) the Government Chemist recommends a solution containing corrosive sublimate which was to be mixed with another one containing shellac. The Chemistry Division has more recently found that the following simpler and non-poisonous solution used as a paint acts as a repellent in preventing insect attack on books:—

1 oz. resin
2 oz. shellac
1 fluid drachm creosote
1 pint methylated spirit.

to which may be added enough methyl salicylate as to give a perceptible odour.

For box-files the writer finds that about a teaspoonful of paradichlorobenzene—a white crystalline substance—will kill all insects present and prevent the entry of any silverfish or cockroaches.

A recent brochure giving a review of all known references to book pests and their control (4) recommends sodium fluoride to kill cockroaches and silver fish, carbon disulphide fumigation for beetles (at the rate of 1 lb to every 1,000 cubic feet of space for 24 hours) and corrosive sublimate shellac as a varnish to repel cockroaches.

REFERENCES.

(1) Jepson, F. P. 1919. *Dept of Agriculture*, Fiji. *Council Paper*, No. 65.
(2) Veitch, R. and Greenwood, W. 1921. *Proc. Linn. Soc., N.S.W.* Vol. 46, Part 4.
(3) Blackie, W. J. 1930. *Agricultural Journal*, Fiji, Vol. 3, No. 2.
(4) Weiss, H. B. & Carruthers, R. H. 1937. "Insect Enemies of Books," New York Public Library.

5. A USEFUL INSECTICIDAL POWDER.

WITHIN the last few years increasing attention has been given to the use of a fine white powder, a by-product of the superphosphate industry, known preferably as sodium silicofluoride but also as sodium fluosilicate. In the United Kingdom and the United States it costs in small amounts about 1s. per pound (" commercial," not " pure ") but in Australia is 4s. per lb; it is apparently quite unprocurable in Fiji. Intending users are advised, therefore, to order direct from Home as the freight and duty are together much less than the extra price charged in Sydney. Although, naturally, a poison, it is not very poisonous to higher animals and is used in poultry spices and as a preservative in wines and beer.

A recent mimeograph by G. J. Spencer of the University of British Columbia gives several uses of this chemical which was recommended in the September issue of the local *Agricultural Journal* for combating the fruit-fly of grenadilla, mango and citrus.

Against clothes moths —which are harmless as adults—it is recommended to dissolve half an ounce of the fluoride in 2 quarts (½ gallon), less one gill, of warm water. This solution may be sprayed on to clothes and furs, while woollen underwear, socks and blankets may all be dipped into it, wrung out and dried. Under western Canadian conditions this makes such materials moth-proof for a year if they are not meanwhile laundered. Its use in the tropics for treating one's non-tropical clothes is indicated.

Cockroaches are controlled by shaking the powder in the form of a very thin layer on floors and shelves and behind stoves and refrigerators or other permanent fittings. It should be left for a week, swept up and more put down in two weeks' time. This powder has been placed in drawers in the laboratory in Suva and no cockroaches have returned to them.

Another household pest is the ant which should have enough fluoride to lie on a sixpence stirred into a table-spoonful of its food- -using maralade if its food cannot be located —and this mixture is placed in tins (or smeared on pieces of carboard where there are no children or pets) and placed about the house.

Finally, it is claimed that a thin layer of powder spread in the runaways of rats will get them as surely as it does cockroaches. This has not been tested under Fijian conditions but is worth trying.

—R. J. A. W. L.

VETERINARY AND ANIMAL HUSBANDRY NOTES.

By

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1.—THE VALUE OF LIVE STOCK TO SMALL FARMERS.

WITH the increase in Fiji of the number of small farmers occupying from 5 to 12-acre blocks, careful attention should be given to the greater and more economical use of livestock on the farms. It is suggested that each farmer should keep for his domestic use and for sale a small stock of poultry, pigs and cattle.

Referring to cattle in the wet zone of Fiji, fodder is abundant provided there is not overstocking, but with proper handling it would be safe to stock up to two head of cattle per acre in addition to the carrying on of agricultural pursuits. This is possible by the growing of crops suitable as fodder, the

utilization of fallow and the tethering of animals. It is preferable for two cows to be kept and the calving regulated so that milk will be obtained from at least one of these throughout the year and for a portion of the year both would be in milk.

The progeny of the cows would be a saleable asset and by selling at two years of age, four young stock would be maintained on the farm at any one time so that each year two young stock would be for sale, and this should yield the farmer from £6 to £8 per annum. In addition the farmer obtains his milk and butter supply for his family, and by keeping a pair of working bullocks he can cultviate his fields so that the keeping of cattle is a sound investment. It has another important use: that is for the manurial value of the dung to the land.

On a small farm it would be well to fence strongly a small area so that the cattle may be safely confined within a fence. A small shed with a good impervious floor should be provided in which to milk the cow and provision should be made for feeding the cows and bullocks with cut fodders, or with grain. The area of land which it will be possible to fence will be small and insufficient for the number of animals carried and to enable them to cover the whole of the area a system of tethering might be adopted at times. Tethering allows the animals to be grazed systematically over the land and to spread their manure over it.

The construction of a concrete floored pigstye with two pens would be a good investment for any small farmer. He should be able to keep one breeding sow and from this sow two litters each year should be obtained so that the farmer could reasonably expect to raise, say, sixteen small pigs each year. It is appreciated that difficulty may be experienced in disposing of these pigs by sale to butchers in Suva, but nevertheless there should be a fairly good sale to Fijian towns for purposes of feasts as well as to provide the farmer himself with an occasional meat ration. The ordinary farmer would have abundant foodstuffs available for the rearing of pigs. Among these foods would be dalo, kumala, para grass, house, food scraps, pumpkins and other vegetable material, but it should be remembered that young pigs do particularly well on a milk diet and every effort should be made to supply them with it.

The reason why concrete is necessary on the floor of the stye in which the young pigs are kept is that it is easily cleaned and cleanliness is essential if young pigs are to be raised free from the kidney worm disease.

A few poultry should also be kept to provide eggs and fowl meat for the farmer and his family. A suitable wire netted enclosure should be provided and simple protection from the weather for the birds when roosting and nesting.

As far as possible the farmer should endeavour to grow his own foodstuffs for the livestock. For cattle a para grass patch and an occasional broadcast crop of maize makes excellent fodder, whilst the ripe maize grain is excellent when ground for the feeding of cattle both for milk purposes and for work. Maize is also very good food for both pigs and poultry, but is always best used crushed. Rice may be used for feeding poultry and rice bran which is a good food for most stock may be obtained from the mills. Rejected bananas may be fed to the pigs and cattle and make very good fodder. Guinea grass grown on the contours of sloping lands and cut every 4–6 weeks also provides excellent fodder.

There is a very good method of tethering cattle if the farmer can afford to secure the equipment, which consists of an iron pin with a swivel top: to this is attached a chain of about 20 feet in length for attaching to a neck

collar on the beast. The animal is then able to graze over a circle of 40 feet diameter; since the top of the pin has a swivel, the chain does not become entangled around the pin and the chain is durable and need not be replaced frequently as would be the case with a rope. This type of tethering outfit costs 17s. 6d. locally.

The Veterinary Division of the Department of Agriculture is ready to give any advice to farmers on points not mentioned in this note and they should consult their district Agricultural Officers whenever they meet with any difficulty so that their trouble may be easily brought to the attention of the Senior Veterinary Officer.

2.—COCCIDIOSIS AFFECTING YEARLING BULL.

MANY readers of the Journal will be familiar with the ravages of Coccidiosis affecting chickens. They will be interested therefore, to learn of the disease having been diagnosed as the cause of a fatal illness of a yearling bull.

Coccidiosis is caused by a single celled parasite affecting the wall of the bowel and perhaps invading the liver. It may be detected by means of the microscope in the fæces of an animal affected with the disease. The parasite somewhat resembles the egg of a parasite worm, from which it must be differentiated.

Although this is the first recorded case of Coccidiosis affecting cattle in Fiji, it is not uncommonly the cause of disease in these animals in other countries. In the case under review it is considered that the infection was derived from fowls and is not therefore, to be regarded as a disease new to Fiji. The calf in question had been raised in close proximity to the dwelling-house of the owner, always in association with fowls. Mortality is reported to have at times occurred amongst these but the cause of this was never investigated. At the time of sickness of the bull, the fowls were apparently in good health.

The animal was ill for one week before veterinary advice was sought. From being a robust calf the animal rapidly wasted in condition so that when seen it was in a advanced state of emaciation. The ilness was associated with gradual loss of apetite and persistent diarrhœa, blood being occasionally observed in the fæces. A feature of the diarrhœa was the severe straining accompanied by spasmodic contractions of the bowel wall.

Diagnosis was made by microscopic examination of the thin fæcal matter. Numerous cocidia were observed which were morphologically the same as those often observed in the fæces of fowls affected with coccidia. Unfortunately the bull died and was buried by the owner the morning after first being seen so that it was not possible to continue the investigation further.

The view is taken that the disease constituted an accidental infection of an abnormal host, *i.e.*, a calf, by a parasite which is common in poultry and it is not to be anticipated that it could become a serious disease of young cattle.

Nevertheless, it will be well to take reasonable precautions by endeavouring to eradicate Coccidiosis from poultry and to prevent contact of calves with poultry affected with the disease.

3.—A NOTE ON PIG FEEDING.

To raise pigs suitable for market at the lowest cost, one should consider the utilization of available locally produced food stuffs to their fullest extent, in preference to imported food stuff. The cheapest form of protein food for pigs is skimmed milk if available. It contains about 3·5 per cent. of casein and albumen, the proteins of milk. Each gallon of milk fed would therefore provide about 5½ ounces of protein food. Skimmed milk also contains about ½ lb of milk sugar and a little over one ounce of mineral salts in each gallon.

When skimmed milk is not available, a food rich in animal protein should be provided as a substitute. The best known substitute for skimmed milk is meat meal. This unfortunately is not manufactured in Fiji and needs therefore, to be imported. This fact suggests the possibility of the local manufacture of meat meal as a side line to the butchering business.

Apart from the use of meat meal, the carcases of surplus bull calves and perhaps some heifers too, should be boiled and fed to the pigs. Should a large number of pigs be kept, the carcases of old or unprofitable cows may be disposed of in a similar manner.

A good protein food and one which is readily available at reasonable cost is coconut meal. It may be fed up to about half the total amount of feed given.

If a rice meal free of hulls were obtainable one could confidently recommend it as a food for pigs. Since however, the rice meal now available contains practically all of the hulls of the rice milled, the proportion of undigestible fibre is very high. The food is therefore, not suitable for feeding to pigs in large quantities because pigs are not able to digest fibrous material except the smallest in quantity.

This reference to rice meal as a food for pigs indicates that with the present method of rice milling much very valuable animal food is being wasted owing to the practise of mixing the hulls of the rice grain with the polish or meal derived from the polishing of the grain. Some readers will remember the very high grade rice meal turned out by the old Government rice mill in which it was the practise first to remove the rice hull and discard it before polishing the grain. The meal thus derived was quite free from adulteration with hulls and therefore, had a low crude fibre content. It has been suggested that the hulls might be separated from the rice meal by the use of a small meshed sieve of large surface area. Such a contrivance might be adopted for use with the small rice mills now in use.

When skimmed milk is not available a reasonable cheap ration could be fed as follows:—

Coconut meal	50 parts.
Meat meal	10 „
Rice bran	10 „
Kumalas	30 parts.
Reject bananas	
Cassava	
Other kitchen refuse	

Para grass, fresh and green: as much as required.

Pigs for butchering purpose should be fed as much as they can consume of a well-balanced ration. The object is to obtain the greatest growth in the least time. Pigs grow more quickly and resist disease more successfully when fed a mineral mixture such as the following:—

Common salt	30 parts.
Bone meal	30 ,,
Wood ashes	12 ,,
Sulphur	8 ,,
Slaked lime	10 ,,
Epsom salts	4 ,,
Sodium sulphate	4 ,,
Sulphate of iron	2 ,,

This mixture should be fed at the rate of from one teaspoonful to one dessert-spoonful per pig per day according to the size of the pig.

Pig raising for local port supplies is, generally speaking, not a profitable undertaking unless an abundant, cheap and easily procured food supply is available.

THE GERMINATION OF TEAK SEED, *Tectona grandis*.

By

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Teak, one of the most valuable commercial timbers of the world, is derived from the teak tree, *Tectona grandis*, a common member of the forests of Burma, Siam and Java from which countries a large export trade has been developed. As far as available records show, this tree was introduced into Fiji about 1906 and individual specimens are to be found in various parts of the Colony. Its possibilities as a forest tree have not been exploited here although specimen samples of seasonal timber on hand at the Government joinery shop of the Public Works Department, indicate its quality as up to standard.

The tree is fast growing and broad-leafed and a single specimen, of a branching habit, attained a height of 40 to 60 feet with a spread up to 40 feet in about thirty years. It is a free seeder and seed has been found to remain viable for two or three years. Germination is, under ordinary conditions, uncertain and prolonged and has in the past hindered rapid propagation of this valuable tree. The Department of Agriculture therefore undertook investigations to ascertain whether it would not be possible to secure a quicker germination and at the same time obtain a higher germination percentage, than was possible under the old method of ordinary seed-bed propagation. The following method, adopted by the writer at the suggestion of the Director of Agriculture, achieved the desired object.

An ordinary market gardener's forcing frame was built, 4 by 4 feet by 1 foot high, the bottom being open to enable it to be placed on the ground or elsewhere as required. The frame was filled with 6 inches of sand which was thoroughly watered to consolidate it. Teak seed was spread as thickly as possible on the sand and carefully pressed down into the sand by means of a flat board, and water again applied.

An ordinary glass window-sash completely covering the top of the frame was now placed on top and the seeds left overnight. The following morning and evening water was freely applied to the seed. On the following day, the sash was raised at one end about 3 inches to allow for free circulation of air and was maintained in this position until germination started about 7 to 10 days later when watering which had been carried out in the morning

and evening was then only applied in the evening. The sash was raised a little more each day until the raised end was about 12 inches high. When germination was such that the box was full of seedlings, the sash was removed so as not to force the seedlings unduly. In three months from sowing, seedlings were ready for transplanting. A variation of the above method—which gave similar results and only delayed germination by about three days, depending on the weather—was by using Wardian cases treated in the same manner as above as regards the seed, but the glass frame was placed only on the windward side. This conserved as well as concentrated the heat and moisture on the seed-bed, but watering was necessary morning and evening for a longer period than with the first method.

From the foregoing it is obvious that a higher temperature and humidity are required for the germination of teak seed than is usually found in the ordinary open air seed-bed and it is noteworthy that the methods used are just as effective in the cool season as in the hot season.

NOTES ON TARO, SWEET POTATO AND BANANA GROWING.

By
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Agricultural Assistant.

1.—A SIMPLE METHOD OF GROWING TARO IN FIJI.

THE taro (or dalo) belongs to the genus *Colocasia* of which over a hundred varieties are grown in Fiji all belonging to two main varieties, namely, dry land and wet land taro. In both cases they should be propagated from "tops," a top consisting of at least a foot of the stem or stems of a mature taro plant with about half an inch of the rootstock or corm to which it is attached. The stems above and the corm below are cut off with a sharp knife. If necessary, the ready-cut tops may be kept without deterioration for two or three weeks in a cool place before planting. The face must be borne in mind that though the growth of the corm takes place under the ground, the growth is upwards from the original section of corm, not downwards.

A.—Cultivation of Dry Land Taro.

Method 1.—(Useful where small areas and irregular land are to be cultivated and ploughing is impracticable). A bed with a diameter of two feet is required for each top or plant, and is dug to a depth of 18 inches. A spade sunk in the centre of the bed is moved back and forth until a hole is made 10 inches deep. The top is placed upright in this hole and the lower six inches covered with earth which should be slightly pressed round the pant by hand. Too much pressure may cause caking or hardening of the earth resulting in poor growth of corm.

Plants should be two feet apart and must be kept weeded all through the growth of the crop. During the process of weeding the remaining part of the hole round each plant is filled gradually with earth.

Method 2.—(A simpler method for Indian cultivation). The land should not be swampy, nor the soil of too heavy a clay.

(1) Plough and crossplough the land.

(2) Run drills a distance of three feet apart. These drills should be at least nine inches deep, and, if necessary, the plough run two or three times up the same furrow to obtain this depth.

(3) Place the plants upright three feet apart in the furrows.

(4) Mound each plant with a spade to a depth of five or six inches.

(5) Young plantations must be kept cleanly weeded, and with each weeding a small amount of additional soil mounded round each plant. By the time the taro is mature the ground round it should be fully filled and level.

An acre field should contain 4,840 plants and yield approximately 9,000lb or 3½ tons.

In each of the two methods of planting the crop takes nine to ten months to mature.

B.—Cultivation of Wet Land Taro.

Tops are selected from wet land varieties of taro and planted in soil through which water is constantly in process of percolation. It is important that the water must not be deficient or stagnant.

Planting is done by the following method:- A sharp pointed pole or narrow spade is stuck into the ground to a depth of at least nine inches and moved round with a circular motion until a vertical hole is produced large enough for the plant to be inserted at the same depth. Immediately upon removal of the implement the plant is placed in the hole, care being taken that the stem is not completely submerged in the water.

This crop takes about twelve months to mature, and the average yield is the same as dry land taro.

Wet land taro is not a suitable crop to market in European centres, as the corms, when cooked, are hard and sticky, and not popular with Europeans. Natives on the other hand often show a preference for it.

2.—KUMALA, SUKIRGUNGI OR SWEET POTATO (*Ipomœa batatas*).

The best soil for producing a good crop of kumalas is of a light, loose nature and the ground should be well ploughed, harrowed and drained before the crop is planted.

The plants are cuttings selected from the vines of a previous crop. The best cuttings consist of about 12 inches cut from the tips of the vines.

For marketing the red or pink variety will be found most suitable.

Planting is done on ridges three to four feet apart which may be made by hand implements or by plough, ploughing being the better and quicker method. Holes are next made in the ridges sufficiently deep to bury half the cuttings which are thus planted in groups of three, with nine inches between groups. The best time for planting for a good market is February to March.

The crop must be kept well weeded in the early stages and it may be found that mounding is necessary after heavy rain; this should be done with a hoe during the process of weeding.

When the crop is about two months old the vines should be gathered, not severed, and laid along the tops of the ridges. This is done in order to increase the yield by preventing the joints of the vines from taking root and themselves producing kumalas which will divert nourishment from the main crop.

The crop is ready to harvest in four months and the best method of digging up the kumalas is with a fork. The most marketable are the medium-sized ones correspoding in weight with a large potato.

3.—BANANA CULTIVATION AND HARVESTING IN FIJI.

Choice of land and preparation.

The best lands for banana cultivation are rich alluvial flats which are naturally well-drained as otherwise artificial draining is necessary.

The field should be lined off in rows ten feet apart and the plants in each row spaced at ten feet. This allows 435 plants to the acre with a hundred

square feet to each plant. The Fijian method of preparing the land, if well done, gives the most satisfactory results since it has been ascertained that clean clearing and ploughing expose the land too much for this crop.

Selection and handling of suckers.

For planting, suckers or side shoots are taken from the underground stem of a parent plant. Suckers should be carefully selected for planting purposes and free from weevil borers. The best are known as sword sucker or spear suckers and are recognised by their shape and appearance.

Great care must be taken in digging suckers from the mother-plant and in transport to avoid damage of any sort to the soft corm of the sucker. If in digging it has been accidentally broken from the mother-plant so as to leave a lacerated surface on the corm, this surface should be cleanly cut of with a sharp knife and a careful examination of the cut should be made to see that no bruised or split portions remain. Injuries are detected by a discoloration of the corm, and bruised parts should be carefully pared away until no sign of bruise is left. As even slight bruises are liable to cause rotting and dying of the plant, gentle handling of suckers at all times is necessary. They must not be thrown from one heap to another nor thrown into lorries or boats. Before planting, the suckers should be cleaned of fibres and lateral roots, using a sharp knife.

Planting.

A hole is dug 18 inches deep and two feet in diameter. Whilst digging the hole the soil is thrown some distance away from the edge. If the sucker to be planted is over three feet in length, the tip should be cut off about 14 or 15 inches above the corm. The sucker is then placed in the middle of the hole. To fill the hole, cut away the sides of the hole from top to bottom with a sharp spade, allowing the well-broken earth gradually to fill the hole to a level with the surface, also covering the top of the sucker and burying it to a depth of one to two inches. The borer readily attacks a feshly-cut banana stem, and the sucker by this method of planting has a chance of escaping immediate attack.

In the case of a sucker 1½ to 2 feet long, it is not necessary to cut the top off before planting, but the top of the sucker must be above the surface of the ground and not buried. In the wet zone of Fiji, pressing of the earth round the sucker should be avoided as this may cause caking of the ground round the young plant thereby retarding its growth.

By planting in the method described above, the ground is loosened to a radius of about three feet round the plant thus assisting the young and tender roots to penetrate the soil.

Cultivation.

The plants in a young banana plantation should be kept cleanly circle-weeded and mulched. The banana plant is a surface-feeder and there is a danger of damaging young roots, hence weeding round the plants should be done with a knife after the plant has reached the age of four months, avoiding the severing of surface roots.

Bananas are grown satisfactorily at high altitudes on hillsides or hilltops provided the soil is suitable. In this case it may not be possible to plough, but loosening the earth round the plant is essential.

Pruning.

Pruning is important as by this means a yield of bunches of satisfactory size is maintained. The best method of pruning is that known as " triangle pruning "; by this is meant that three of the healthiest suckers are left in

a triangle round the mother-plant. The suckers which are being destroyed should be cut off to a level with the ground and then destroyed with a long narrow spade or an iron spear. The instrument pierces the heart of the sucker by being pressed in a downward direction until the corm of the sucker is felt, and then twisted with a circular movement to ensure complete destruction. Lastly the severed surface is covered with earth and firmly pressed with the foot.

Pruning should be done when the plants have reached the age of five to six months and great care must be taken. When the technique of pruning is thoroughly understood and practised, it is then possible to regulate the time of bearing of fruit.

Bearing of fruit.

The banana plant—especially the "veimama" Variety—will come into bearing seven to eight months after planting. When the plant is about to bear it will throw a small leaf known as the "flag leaf" which is immediately followed by the flower, better known in this country as the "soba." Within three or four days of the first appearance of the flower it will start to lean over and this is the time when it should be cleaned, brushed and powdered. Firstly, cleaning is done by removing the outer sheaths which cover the young banana bunch; secondly, with a fine brush all adult insects or grubs are gently removed and lastly, the young bunch is carefully dusted with a one-to-three mixture of pyrethrum powder and wood ash by placing the fingers of the hand between the fingers of the young bunch and puffing the powder well in between these fingers. A rubber puff for the purpose is stocked in most town or country stores. Great care must be taken in this operation that no damage is done to the young fruit and with a little practice a man can become an expert in this work and can clean 120 to 140 flowers or bunches per day.

Harvesting.

Three months after the appearance of the flower, in summar, the bunch is ready for harvesting. In colder weather it may take four months to come to the required degree of maturity. The harvesting of the fruit must be done with the utmost care. In cutting the bunch from the mother-plant the following method is advisable:- With a knife the cutter nicks the trunk about two to three feet below the bunch and taking the bunch in his left hand he pulls it gently toward him. As the trunk falls slowly forward he maintains a secure hold of the bunch to prevent it falling heavily to the ground, at the same time severing its stem with the knife in his right hand. The stem of the bunch is cut near its junction with the plant, leaving a foot or more of stem attached to the bunch. These stems are an essential part of the method commonly used in transporting the bananas from the field. A man carries two bunches at a time by means of a pole, the bunches being tied at each end of the pole by their stems.

Handling of bunches.

In the handling of bunches in transport from the plantation to shipping port nearly as great care must be exercised as with a basket of eggs. In putting down a bunch the stalk (or cut stem) end should be placed on the ground and the bunch kept in a vertical position with the tip uppermost. A number of bunches standing in the same manner will each support the other and bruising of fruit will thus be prevented. A bunch should never be laid on its side unless well padded with dry banana leaves or other suitable padding. During transportation by lorry or by punt, bananas may be carried with safety, one bunch lying on another, provided there is sufficient padding between bunches.

In discharging the punt or lorry the topmost bunch is removed first, the bunch being grasped at both end simultaneously and lifted directly upwards until clear of other bunches, care being taken to see that no bunch is pulled across another one.

REFERENCES.

Nicholls, H. A., and Holland, J. H., "Text Book of Tropical Agriculture," 1929.
Farmers' Handbook of New South Wales.

FOOD OF THE GIANT TOAD.

Complaints still continue to be made about the habits of the introduced toads so that the following additions to its diet, as revealed by the stomach-contents, should be of interest. Examination of a nearly mature female dissected on September 14th showed:—

2 red millipedes.
1 small centipede.
3 *Subulina octona* Breug (the "small univalve snail" of this Journal, Vol. 8, No. 4, Dec., 1937. p. 36).
2 larger snails.
8 large ants.
3 *Elytroteinus subtruncatus* Frm., a medium-sized weevil.
1 *Acalles* sp.—a smaller weevil.
2. *Cosmopolites sordidus* Chevr. the banana-borer.

The presence of the last-mentioned insect is of more than ordinary importance as it proves that the toad is eating this harmful banana pest and it should be mentioned that this record was obtained from a garden in Suva where bananas were not growing. Although this insect has been recorded as a constituent of the toad's diet in Jamaica it has not apparently been mentioned before in Fiji except for a last minute mention in the September Editorial.

The writer is indebted to Dr. E. Zimmerman of Honolulu for kindly identifying two of the weevils, which would otherwise have had to be sent for determination to London, thereby saving much time.

—R.J.A.W.L.

TURMERIC (*Curcuma longa* L).

By
SILAS RAM JAN,
Indian Field Assistant.

Turmeric is found growing wild in many of the hilly parts of Fiji. It is so plentiful that rarely, if ever, is any planted as a crop. It is however, dug and cured by some Indians who dispose of it at the bazaars in the main centres of population.

The crop takes about nine months to mature and is ready to harvest when the leaves pale and yellow and then stem above the ground withers to dryness. The rhizomes are dug at this stage and after cleaning are boiled in water for 5 or 6 hours, and sun dried for up to two weeks when turmeric has become quite hard. The outer skin is then removed by partly filling a sack, violently rubbing and shaking the contents. It is in this form that turmeric is sold in the bazaars.

To make the typical curry used by the whole of the Indian community it is pounded to powder between stones and mixed with various spices. Indians frequently use it mixed with mustard oil and heated in the form of a "poultice" to relieve the pain and swelling of bruises and sprains.

Fijians use the leaves draped around the neck at their dances, as a pleasant odour is given off when the leaves are beaten or rubbed together.

Considerable quantities of the dried, prepared root are used in Fiji and the bazaar price is usually about threepence per pound.

REVIEWS.

SOYA BEAN MILK.

Soya bean milk is rich in proteins, fats and vitamins and is, therefore, a valuable food for infants, if diluted as cow's milk usually is for very young children. Dr. H. W. Miller, a physician widely known in China and in America, states that soya milk "can be used from earliest babyhood to the declining years of life" and it may be used in practically any of the ways in which cow's milk is used—as a drink, in soups, bread and puddings, pancakes, salad dressing, &c. Under suitable conditions soya bean is easily grown and the milk is readily made from the mature bean so that its use, if popularised, should prove a useful addition to the diet of the Fijians, especially where cow's milk is not easily obtainable, a condition of affairs commonly found in Fijian villages. Two simple methods of making soya bean milk are well known in China, but other methods suggest themselves.

In one method, wash the beans, then dry them thoroughly. When dry, crack them by quick direct heating in a sieve, then grind them finely. To each pound of beans add 6 pints of water and allow to soak for two hours. Then boil the mixture for about 20 minutes, stirring constantly. Strain the liquor through cheese cloth. A little sugar or salt or both may be added to give a desirable flavour but no other flavouring is necessary. Cool and keep in a cool place or in a refrigerator.

In the other method, the beans should be washed and then allowed to soak overnight in clean water. The skins should then be removed and the beans finely ground and then put into a cheese-cloth bag. The bag of ground beans should then be placed in warm water, using 6 pints of water for each pound of beans and worked thoroughly with the hands for about 10 minutes. The bag is then withdrawn from the water and well squeezed until no more extract can be pressed out. This milk is then boiled for half an hour, care being taken to stir frequently to avoid scorching, or better by boiling in a water-jacketed or double saucepan. The liquor is then strained and flavoured, if desirable, with a little sugar, salt, cocoa, or other flavouring, and kept in a cool place. The mash left after extracting the milk contains little flavour but valuable food-substances.

These may be utilised by adding half a teaspoon of salt to each pint of the mash, moistening with a little soya milk if necessary. Boil for about an hour or until the raw soya bean flavour is gone, in a double-bottomed boiler, and keep in a cool place in a covered jar for use as required. In this form, the mash may be used for a variety of dishes such as croquettes, souffles, cheese rarebit, soya loaf, salads, sandwich fillings, macaroons, cakes, paste, fudge, &c.

Soya bean milk may also be made into curd either by fermenting it in a warm place or better by adding 1 part of vinegar for every 8 parts of milk, stirring to mix well and then settling for a few minutes. Then place the curd in a cheese-cloth bag, dip the bag in cold water several times to wash away excess acid and then drain for an hour before pressing out the remaining liquid. Season with salt and pack into a dampened mould, cover and store in a cool place until it is firm enough to cut. Curd, thus

made, can be used for various dishes including vegetable and fruit salads, sauces, omelets, chop suey, curry puffs, &c., of which particulars may be obtained on application to the Department of Agriculture. In the curd form, soya is very largely used in oriental countries and is reputed to be highly nutritious.

In drawing up this note, free use has been made of E. J. Kingsley's pamphlet entitled, " Soyabeans and Soyabean Products for Table Use."

—H.W.J.

SCHEMES FOR THE IMPROVEMENT OF LIVE STOCK IN IRELAND

(*Saorstat Eireann*).

In the annual report for 1936-37 of the *Saorstat Eireann*, much useful information is given on schemes employed for the improvement of live stock and poultry, in addition to the subsidisation of shows, ploughing matches and such-like competitions.

In connection with horse-breeding no less than 389 approved stallions were registered. These included 156 thoroughbreds, 114 Irish draughts, 47 Clydesdale and Shires and 72 half-breds. In addition, a subsidy of £20 was paid to owners of 25 colts, selected as promising young stallions, provided that each colt was well cared for for 12 months. On re-examination at the end of that period a similar subsidy is to be paid to each owner. The majority of these selected colts are eventually purchased by the Department of Agriculture for use as service stallions.

Similarly, 2,832 mares were selected for free service by stallions on the Department's register, the fees of the owners being paid by the Government. The selection of such mares depends on inspections made by independent judges and by veterinary surgeons at various country centres preference being given to animals of good conformation under six years of age.

Also, 284 mares of the Connemara pony breed and 21 stallions were on the Department's select register at the end of the year. These ponies are of special value in the west of Ireland.

As regards the general cattle-breeding scheme, efforts are made to assist farmers and others to purchase and maintain suitable bulls of a high degree of excellence and to make them available for service at greatly reduced rates. Under the scheme the following breeds are recognised—Shorthorn, dairy Shorthorn, Aberdeen Angus, Hereford, Kerry and Galloway.

The Department selects annually a number of farmers to purchase bulls of the specified breeds, having regard to the special needs of each district. Each selected purchaser is given a premium varying from £12 to £22 according to the breed of animal purchased, provided that the purchaser undertakes to feed and care for the bull adequately and to permit it to serve a minimum number of cows at a moderate fee prescribed by the Department. The minimum number of services is 30 in the case of a yearling bull and 40 for an older animal and the fee varies up to a maximum of five shillings, but in certain poor areas the maximum is half-a-crown.

Premium bulls may be used for four years, the premium being renewed each year, subject to satisfactory results and good veterinary reports.

In addition, selected bull purchasers are further assisted by the provision of loans at 5 per cent. interest for the purchase of premium bulls, each loan being limited to two-thirds of the purchase price of the bull and being repayable within two years. Such loans are only granted after departmental inspection of the selected bulls and provided that each purchaser insures each bull purchased against death and unfruitfulness.

Similar loans are made available for the purchase of approved stallions but repayment in this case is extended to a five-year period.

In the improvement of dairy herds a scheme for the registration of pure dairy cows is in force, by which pedigree cows are first inspected for general appearance and if approved are subjected to milk tests before registration. The milk tests naturally include volume of milk (minimum 6,000 lb per period), percentage of milk fat, &c., and only those cows which attain to a high standard are selected. A similar scheme exists for non-pedigree dairy cattle of the Dairy Shorthorn and Kerry breeds. There are now 30,813 registered cows under this scheme, 90 per cent. being Shorthorns.

The improvement of pigs and sheep is assured by service schemes and liberal purchase loans very similar to those in force with cattle. The favoured pig breed is the Irish Large White and the premium for registered service boars is £6 in the first year and £5 in the second year; while the price of such boars is fixed annually—in 1936 it was £8. With both sheep and pigs, as with cattle, the Department of Agriculture assists by maintaining numbers of "extra" premium rams and boars for use in the poorer districts. Thus in 1936, the Department kept 155 "extra premium" service rams.

In certain areas pedigree male goats are provided at greatly reduced prices with a view to the improvement of milk production of goats, mainly with the Anglo-Nubian and Toggenberg breeds. The premium paid for registered service male goats is £2 per annum for a minimum of 20 services in the first year and 30 in the second year. Also direct financial assistance is given to the Irish Goat Breeders' Society which rears and breeds a number of high standard goats annually.

In schemes to improve the poultry breeds, the distribution of pure-bred hatching eggs is subsidised to enable eggs to be purchased at very moderate prices. The breeding of high class pedigree cockerels and the services of pedigree turkey cockerels are also subsidised.

Annually, a premium of £8 is paid to each of a number of selected poultry farmers who agree to keep, according to specified regulations, egg distribution stations for hens or hens and ducks. Only one breed of hens or one breed of hens and one breed of ducks may be maintained at each station, the owner of the station being obliged to supply during the season (December to mid-May) at least 70 settings of eggs to residents in the district at a price not exceeding half-a-crown per setting (12 eggs) in December—January or 2s. per setting for the rest of the season. Only eggs exceeding 2 ozs. (hens) or 2¼ ozs. (ducks) may be sold for hatching purposes. The breeds of hens included in this scheme are Leghorn (white and black), Black Minorca, Rhode Island Red, White Wyandotte, Buff Orpington, Buff Plymouth Rock, Barred Plymouth Rock, Sussex and Salmar Faverolle; ducks are restricted to Pekin, Aylesbury, Khaki Campbell, Indian Runner and Buff Orpington. They were 1,074 of these stations in 1936—37.

A premium of £10 per annum is paid to a number of selected reliable and trustworthy poultry keepers who maintain trap-nest stations which are designed to test the annual and winter laying capacities of various breeds of hens and to provide a convenient source from which ordinary premium stations can be stocked with high class pedigree fowl of good stamina, and with reliable laying records. There were 67 such stations in 1936—37.

Similarly, during the same year there were 286 stations for the distribution of goose eggs, each station being granted a premium of £2 for the year provided that only birds of the "Emblem" breed were kept and that at least 10 settings (3 eggs to a setting) were provided between January and May to the district at a price not exceeding three shillings per setting.

Turkey egg stations numbered 77, each station having one "American-Bronze" stock turkey cockerel and 4 to 6 turkey hens. Each station holder is obliged to distribute not less than 15 settings (3 eggs per setting) of eggs between 1st February and 30th April at a price not exceeding three shillings per setting. The premium for each turkey egg station is £3.

There were 1,382 turkey cock stations in each of which only one turkey cockerel of the "American-Bronze" breed was kept. The premium in this case varied from 50—70 shillings per station, each cock being permitted to serve a maximum of 40 hens and a minimum of 20 hens in the season at a maximum charge of one shilling per service for the first 20 services.

All eggs supplied from any of the above-mentioned stations carried an authorised stamp and a number of investitations were made by the Department to ascertain the fertility of the eggs and the quality of the birds obtained therefrom.

The feeding and housing at each station had to satisfy inspecting officers and grants were made available for new stations to the extent of half the cost of new buildings, where necessary, and also financial assistance was provided for the purchase of pedigree male birds, and of incubators of at least 100 egg capacity.

In addition, poultry prize schemes were in operation between small holders in certain districts, the main points being given for breed, quality, health, method of feeding, condition and suitability of poultry houses, keeping of records, cleanliness and general management.

National egg-laying competitions were held for six classes of hens and five prizes (£10, £7, £5, £4, £2) were awarded to each section, and a silver cup (or its value, £10) was offered for the best pen (6 pullets) in the competition. Additional prizes were granted for the best winter record by (*a*) a pen of non-sitting birds, (*b*) a pen of sitting birds, (*c*) an individual bird of non-sitting type, and (*d*) an individual bird of a sitting breed.

In the national egg-laying competitions, of all the birds entered, over the whole 48 week period, breeds averaged between 193 and 201 eggs per bird, the order of merit being Light Sussex, White Wyandotte, Rhode Island Red, White Leghorn and Buff Plymouth Rock. The average egg production of all birds (682) in the competition was 192 eggs per bird, giving an average egg value per bird of 21·2 shillings, an average cost of food per bird of 7s. 6d. and an average return per bird over cost of food of 13s. 9d.

—H.W.J.

SUGAR IN JAMAICA.

In a "Survey of the Yields of Sugar Cane in Jamaica" recently published by Mr. H. H. Croucher, Agricultural Chemist, it is stated that plant canes in 1935–36 produced an average yield of 35·30 tons of cane per acre. First ratoons averaged 22·09 tons per acre, although the predominent varieties averaged over 24 tons. The average yields fron second ratoons was only 2 tons per acre less than first ratoons, while in the season under review, third ratoons gave average yields approximately equal to first ratoon canes.

The predominating varieties are B.H. 10/12 and P.O.J. 2878, these two occupying over 50 per cent. of the total area under cane.

—H.W.J.

PINEAPPLES.

In leaflet No. 42 of the Department of Agriculture, Mauritius, 1938, Mr. A. N. Coombes, Agronomist, describes a "Manurial Trial with Pineapples." The trial indicates that after a basic application, in two doses about 6 months apart, of 262 kilos of phosphate guano and 187 kilos of sulphate of potash, the application of 331 kilos of sulphate of ammonia in 3 doses gave significantly enhanced crops of good quality fruit compared with controls and with smaller amounts of sulphate of ammonia. These results are given after a single trial only and the composition of the phosphate guano is not stated. The spacing adopted in the trial allowed for 9,200 plants per acre, good cultivation was maintained and the system of planting was that known as the "double row system." The best treatment yielded at the rate of 15 tons of fruit per acre of which 10·6 tons were grade A fruits, 4·25 tons grade B and 1·5 grade C, according to the grades established in the Canning Factory, where grade A refers to fruits larger than $5\frac{1}{8}$ inches in diameter, grade B to fruits varying between $4\frac{1}{4}$ and $5\frac{1}{8}$ inches and grade C to fruits varying from $3\frac{7}{8}$ to $4\frac{1}{4}$ inches in diameter.

—H.W.J.

OBITUARY.

Joape Kunadei.

We regret to record the death from meningitis on 16th November, after a short illness of Joape Kunadei, a Native Field Assistant, stationed at the Central Agricultural Station, Naduruloulou.

One of the first Fijian youths to avail himself of the training scheme of the Department of Agriculture, Joape Kunadei entered as a student in March, 1930. Completing his course at the end of 1932; he was appointed on the 1st February, 1933, as a Field Assistant for duty in the banana areas of the Waidina and Wainimala Districts.

He subsequently served at the Citrus Research Station, Nasinu, and in Nadroga Province: returning in April, 1937, to the Central Agricultural Station and he was placed in charge of ploughing instruction of meteorological observations in which he maintained a high standard of instruction in ploughing, cultivation practice and in the care of animals.

The effect of his work was quickly apparent in the field, a regular cultivation schedule being adhered to and weed-growth reduced to a minimum in all plots. Station records for which he was responsible were kept with accuracy and fidelity.

In the field of sport, Joape held a good record. As a runner, he won many events at athletic meetings in Suva and on the cricket and football fields he showed considerable promise, playing for Gaunavou, the Agricultural Department and Rewa Clubs.

Of a generous and cheerful nature, he was deservedly popular with all members of the Staff with whom he came in contact: his unexpected death at the early age of 25 is deeply regretted. He was married in January of the present year and to his widow and relatives we offer sincere sympathy.

—B.E.V.P.

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—R.J.A.W.L.

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